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A study of a Pre-Kansan peat deposit

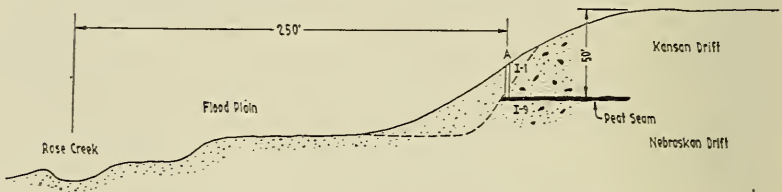
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Authentic early studies of American preglacial and interglacial deposits, although not numerous, have been known for a considerable time. In 1870 Orton (4) described an extensive bed in southwestern Ohio. In 1878 McGee (3) reported the presence of similar deposits in northeastern Iowa. The latter were referred to as the "forest bed" and they were later correlated with Aftonian gumbotil. In the geological report of March 10, 1882, Winchell (5) cited buried deposits in southeastern Minnesota, particularly in Mower and Fillmore Counties.

The considerable interest in postglacial peat manifested by numerous studies in recent years has suggested the desirability of focusing attention upon some of the much older deposits. Accordingly, the stations cited by Winchell as occurring on the farm of "Mr. Thomas Smith, S.E. $\frac{1}{4}$ Sec. 12, Windom twp.," Mower County were revisited for detailed study. The first of these, of the Aftonian or the first interglacial period, is located in a pasture about one fourth mile south of the present Smith dwellings. The peat was originally reported as exposed in the banks of Rose Creek, but at present wash from the adjacent fields under cultivation has cut down the bevel of the ledge and this, together with the humus from the forest, has built up a talus that now buries the seam of peat to a depth of about 6 feet. Upon removal of part of this talus a fresh section was exposed along what was evidently the former ledge. Nine samples were taken at designated intervals. A diagrammatic representation of the outcrop (Station 1) is shown in the following sketch.

The samples for the study were taken from the shaft sunken at A and will be referred to under the following designations: I-1 from the surface; I-2 at 1 foot; I-3 at 3 feet below the sur-

face; I-4 from the rock flour immediately above the peat; I-5, I-6, I-7, and I-8 spaced at intervals of 5 inches through the seam; and I-9 from the Nebraskan drift.



Section showing location of interglacial peat deposit.

The Kansan drift, I-1 to I-3 inclusive, appeared much like the rock flour below except that there were a number of grit fragments and pebbles present in the former. Directly above the peat was a bed (I-4) of very fine rock flour showing what was interpreted in the field as varves. The peat seam, I-5 to I-8 inclusive, a deposit 20 inches in thickness, appeared to be richest in organic matter near the middle. Pieces of this peat are readily broken along the contact line of the thin laminations. Sample I-9, the Nebraskan drift, is a well-weathered, sticky, dark gray-black earth, with a few pebbles showing considerable disintegration.

A laboratory study of the deposit was made to determine the physical nature of the environment and the organic matter present.

To retrieve any plant fragments in the samples it was necessary to loosen the particles of soil from one another. This was accomplished by adding distilled water in excess, then gently stirring and mashing the resulting mixture with the fingers. After the wood fragments were removed, the mixture was evaporated to dryness in an oven. The dried lumps were crushed between the fingers and later screened, using the Tyler Standard Screens for the analysis.

High percentage of clay and silt is characteristic throughout the series but especially through the peat and the member directly above. Sample I-9 shows a silt and clay content of 79.61% which is in accord with analysis made by Kay and Apfel (2) for Nebraskan drift. It is also noteworthy that there are no rock fragments greater than 1.96 mm. which may partially be accounted for by the very thorough weathering of the

original drift surface. Samples I-4 to I-8 inclusive show percentages of clay and silt ranging from 91.‰ to 96.13‰ and, together with the laminated nature of the deposit, seems to indicate a proglacial lake of early Kansan time. The extent of such a body is not known at present.

An examination of the analysis of the Kansan drift of the overlying extramorainic till plain shows a mixture of greater size range. The largest of the few grit and pebble fragments are smaller than 15.85 mm. and the bulk of the material is medium sand, fine sand, clay, and silt.

The percentage of volatile matter was found to be approximately 10‰.

Following the pioneer work of Orton, McGee, and Winchell, there were a number of studies of buried peat deposits in Iowa. Various workers speak of pieces of cedar and tamarack wood, several mosses, and occasional angiosperms being found in wells, road cuts, and similar excavations.

More recent work, such as that of Sears, Lane, Wilson, and Voss of this country and Erdtman of Sweden, has stimulated further study of these deposits, especially of the pollen which they contain.

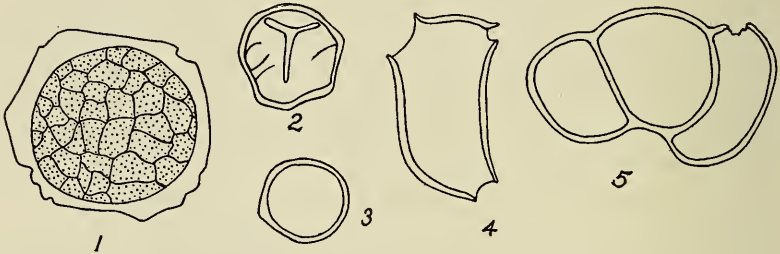
Small chips of wood were found throughout the sediment described above. These are in a remarkably good state of preservation. They were embedded in celloidin, sectioned, stained with Delafield's hematoxylin, destained with acid alcohol, and mounted in balsam. An examination of some 40 slides showed a predominance of spruce and tamarack. Several moss fragments were found, none of which was in an identifiable condition.

Pollen analysis was patterned after the method recently suggested by Erdtman (1) except that the second treatment with sodium chlorate and sulfuric acid was eliminated. Samples of the residue obtained were mounted in Erdtman's lactophenol solution. No statistical analysis has been attempted to date.

Pollen from the following has been identified: *Picea* sp., *Abies balsamea*, *Pinus* sp., Betulaceae (perhaps *Corylus*), *Acer rubrum*, *Lycopodium complanatum*, *Lycopodium lucidulum*, *Juglans* or *Carya*, *Juniperus* or *Larix*, *Prunus*?

In addition to the pollen, several fragments of grasses and sedges and a few trichomes were observed.

From the foregoing facts, one may conclude that a seam of peat was laid down in a swamp during Aftonian or early Kansan time. As the ice sheet approached, a glacial lake formed in which



Camera lucida drawings of spores:—(1) *Juglans* or *Carya*— 58μ ; (2) *Lycopodium lucidulum*— 32μ ; (3) *Juniperus* or *Larix*— 26μ ; (4) Betulaceae (perhaps *Corylus*)— 49μ (somewhat distorted); (5) *Picea*— 71μ .

varved clays were deposited over the peat. A critical study of the plant remains shows that a northern coniferous plant cover was present in southeastern Minnesota during the Aftonian interglacial or the early Kansan glacial period.

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